TK-850/JG2+NET
Hardware User's Manual

TESSERA TECHNOLOGY INC.

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1 TK-850/JG2+NET

V850ES/JG2 is the NEC Electronics 32bit single chip microcomputer.
The features and hardware specification of an evaluation board (TK-850/JG2+NET CPU board) of V850ES/JG2 are described.

1.1 Features

Features of the TK-850/JG2+NET CPU board are as follows.

- ●NEC Electronics 32bit single chip microcontroller. (μPD70F3718GC).
  All of the ROM, RAM and circumference circuit are efficiently built in one chip on a single board.
- ●Enable to evaluate applications using mail and HTTP server with Ethernet access as it supports LAN controller (SMSC LAN9115)
- ●Lightweight TCP/IP stack that can run on built-in memory from NEC Electronics.
- ●Easy to use as removable storage and to install OS, as it has SD card interface.
- ●Enable to make serial communication (1ch) with host PC via USB connection, even the ID-850TK debugger is in use.
- ●High speed with built-in 20MHz clock.
- ●Sub clock 32.768KHz as default.
- ●The high speed RAM: 40K-byte and the flash memory 512 K-byte are built into CPU chip.
- ●28 I/O ports are equipped for expand use.
- ●The board itself is quite and easy to handle; CPU board size: 89mm×69mm.

1.2 Attached goods list

- ● TK-850/JG2+NET CPU board
- ● Development tool／Manual CD-ROM
- ● USB cable (MINI B←→A)
- ● AC Adapter (DC5V)

1.3 Hardware specification

Item		Details
CPU	Parts number	μPD70F3718GC-8EA-A
	Operation with main clock	20MHz
	Clock	Main ：5MHz、Sub：32.768KHz
	Internal flash memory	512KB
	Internal RAM	40KB
	Operation voltage	3.3V
	I/O voltage	3.3V
Interface		USB (MINI B receptacle)
		Ethernet （RJ-45 10/100M)
		RS-232C (Dsub-9pin plug)
		SD Card connecter
		N-Wire connecter (Only SICA pad)
		Expansion connecter 30pin (Only pad)
		Temperature sensor
		AC adapter input connecter
Power supply		5.0V

2 Switches and LED

2.1 SW1

Bit1～5 of SW 1is dip switch for operation mode setting. Bit6～8 are connected to P79～P711 for multipurpose input .

2.1.1 Please change to the following settings when you use ID850-TK of this product attachment.

SW1

Bit 1	ON
Bit 2	ON
Bit 3	ON
Bit 4	OFF

※ **When ID850-TK is used, these terminals cannot be used because it communicates with the host machine by using and the terminal P30 and P31.**

2.1.2 Please change to the following settings and reset it once when you execute the program written in the flash memory with built-in CPU without using ID850-TK.

SW1

Bit 1	OFF
Bit 2	OFF
Bit 3	OFF
Bit 4	OFF

2.1.3 Please change to the following settings when writing it in the flash memory with built-in CPU by using PG-FPL. (The hardware of PG-FPL is built into TK-850.)

SW1

Bit 1	ON
Bit 2	OFF
Bit 3	ON
Bit 4	ON

2.1.4 Please change to the following settings when you connect N-wire emulator.

SW1

Bit 1	OFF
Bit 2	OFF
Bit 3	OFF
Bit 4	OFF

2.1.5 The Bit5 of SW1 is to switch ON/OFF of RS-232C level converter (MAX3245) output.

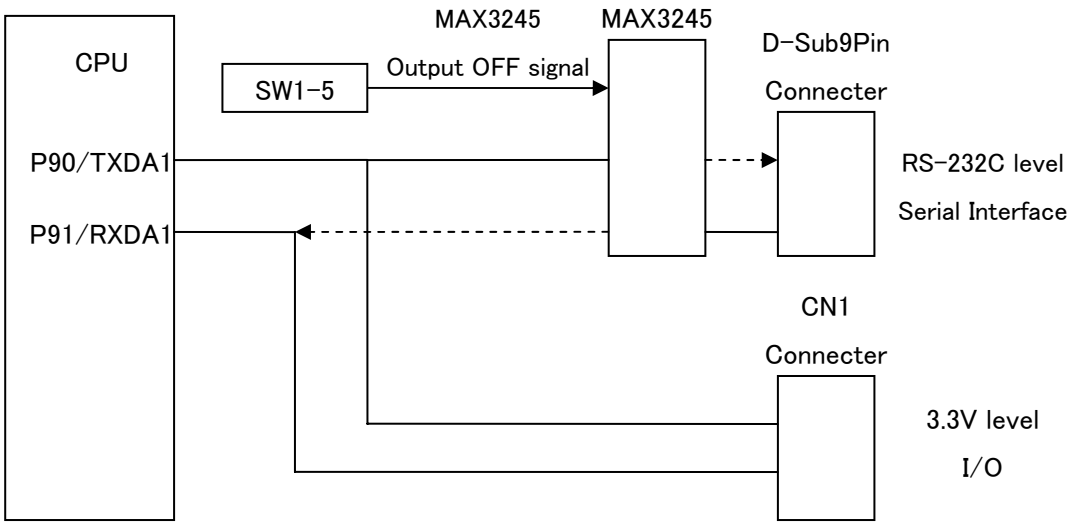
・When you use P90 and P91 port of CN1 extended connector, you need to set the RS-232C level converter output to OFF by setting Bit5 of SW1 to ON.

・When you use the communication via RS-232C connector, you need to set Bit5 of SW1 to OFF.

SW1- Bit5

Operation	RS-232C level converter status
ON	Output OFF
OFF	Output ON

:You can set the dotted arrow to off in the following chart.



2.1.6 Bit6-8 of SW1 is connected with the following terminals CPU.

Connect to GND by switch ON.

It becomes "Low" by switch ON and "High" by switch OFF.

SW1

Bit 6	P79
Bit 7	P710
Bit 8	P711

2.2 SW2, SW3

SW 2 and SW 3 are push switches. There are connecting to pull-up resister. It becomes "Low", while they are being pushed. and It becomes "High" if the switch separate,

SW2,SW3

	Signal name	Terminal CPU name at connection destination
SW2	P50	P50/TIQ01/KR0/TOQ01/RTP00
SW3	P51	P51/TIQ02/KR1/TOQ02/RTP01

2.3 SW4

SW4 is the reset switch. CPU can be reset by pushing.

2.4 LED1, LED2, LED3, LED4

LED1,2,3 and 4 are available for applications. To make an LED on,
please set the output port LOW.

LED1,LED2,LED3 and LED4

	Signal name	Terminal CPU name at connection destination	Notes
LED1	PDH0	PDH0/A16	
LED2	PDH1	PDH1/A17	
LED3	PDH3	PDH3/A18	
LED4	PDH2	PDH2/A19	

2.5 LED5

`Power LED'. LED5 is activated when the power supply is turned on.

2.6 LED6～LED8

They show the status of LAN controller.

	Displayed Name	Function
LED6	SPEED	Speed Indication
LED7	LINK	Link & Activity Indication
LED8	F-DUP	Full-Duplex Indication

2.7 J1

It is power supply of CPU.

1-2 Short It supplies power from USB connected to USB1 connector.

2-3 Short It supplies power from external AC adapter.

3 NWIRE1 Connector

It is a connector for the N-Wire emulator.

You can connect an emulator such as IE-V850E1-CD-NW.

N-Wire emulator can be connected to NWIRE1 by soldering SICA2P20S (connector from Tokyo Eletech) and using SICA20I2P (conversion adapter from Tokyo Eletech).

Please do the following setting when you connect N-Wire emulator.

- Bit1,2, 3, 4 of SW1 are turned off.

4 Terminal list

This is the terminal list for the extended connector CN1 on TK-850/JG2+NET CPU board. CN1 is not mounted.

CN1 terminal list (HONDA CONNECTORS FFC-30BMEP1:Not mount)

CN1	Signal name	Terminal CPU name at connection destination	Notes
1	VDD	VDD	
2	P10	P10/ANO0	
3	P11	P11/ANO1	
4	RESET0	RESET#	Connected to NWIRE,RESET circuit
5	P02	P02/NMI	
6	P03	P03/INTP0/ADTRG	
7	P06	P06/INTP3	Connected to CTS of RS232C as well
8	P33	P33/TIP01/TOP01	
9	P34	P34/TIP10/TOP10	
10	P35	P35/TIP11/TOP11	Connected to RTS of RS232C as well
11	P36	P36	
12	P37	P37	
13	P90	P90/A0/KR6/TXDA1/SDA02	Connected to TXD of RS232C as well
14	P91	P91/A1/KR7/RXDA1/SCL02	Connected to RXD of RS232C as well
15	P910	P910/A10/SIB3	
16	P911	P911/A11/SOB3	
17	P912	P912/A12/SCKB3	
18	P914	P914/A14/INTP5/TIP51/TOP51	
19	P915	P915/A15/INTP6/TIP50/TOP50	
20	PCM0	PCM0/WAIT#	
21	PCM1	PCM1/CLKOUT	
22	PCM2	PCM2/HLDAK	
23	PCM3	PCM3/HLDRQ	
24	P76	P76/ANI6	
25	P75	P75/ANI5	
26	P74	P74/ANI4	
27	P73	P73/ANI3	
28	P72	P72/ANI2	
29	P71	P71/ANI1	
30	GND	VSS	

5 USB Interface

When you connect the host PC and USB1 connecter with USB cable, two COM ports exist on the host PC.

As default, it assigns Ach to smaller number COM port and Bch to larger number COM port.

Ach is used for debugging with ID850-TK and writing programs to the built-in flash memory.

Bch is used for general serial interface for host PC.

USB Interface Controller	Connect To
A ch	UARTA0
B ch	UARTA2

* For detail about installing USB driver, refer to "USB driver's install".

6 RS-232C Connector Terminal List

By setting bit5 of SW1 to OFF, you can use RS-232C level serial communication from RS232C1 connector with using UARTA1.

Also, RTS output and CTS input can be used (Active-Low).

RS232C1 Terminal List

Pin No.	Signal	Terminal CPU name at connection destination
1		N.C.
2	RXD	P91/A1/KR7/RXDA1/SCL02
3	TXD	P90/A0/KR6/TXDA1/SDA02
4		Connected to Pin6
5	GND	GND
6		Connected to Pin4
7	RTS	P35/TIP11/TOP11
8	CTS	P06/INTP3
9		N.C.
Shell		N.C.

7 LAN Controller

LAN9115, LAN controller from SMSC, is mounted on the board. It can use Ethernet communication complying with IEEE802.3u 100BASE-TX from CN4 connector.

7.1 Connection

Connection between CPU and LAN controller is shown below.

CPU Pin Name	Signal Direction	LAN9115 Pin Name	Logic
A2-A8	→	A1-A7	
D0-D15	⇔	D0-D15	
PCT6	→	nCS	Active-Low
RD (PCT4)	→	nRD	Active-Low
WR0 (PCT0)	→	nWR	Active-Low
P99	→	nRESET	Active-Low
INTP4 (P913)	←	IRQ	Programmable

7.2 Reset of LAN Controller

LAN controller can be reset using the P99 port.

7.3 Access to the LAN Controller

It is need to set external bus to separate mode for accessing to the LAN Controller.

LAN controller address is connected to CPU address on the 1bit shift. So LAN controller resister mapped on skip over 2 Words (4Byte). Also it cannot Byte access to LAN controller, because nBE 0 and nBE1 signal make low level at the same timing.

The Chip Select (AEN, nADS) of LAN controller uses the PCT6 port, Please make the low level when access to LAN controller. and If access ends, make high level.

8 SD card interface

・For accessing SD card, use CSIB0.

・SD card signal line (CS, DataIn, CLK, DataOut) has buffer circuit for protecting CPU. Set PDH4 to "Low" to enable the buffer output when accessing SD card.

・You can control the power supply to SD card through P78 port. Set P78 to Low to supply power to SD card.

・Low level is entered to P04 (INTP1) when SD card is inserted to SD card slot. High level is entered when SD card is not inserted to SD card slot.

・High level is entered to P77 port when SD card with write-protected ON is inserted to SD card slot (CN3). Low level is entered to P77 port when SD card with write-protected OFF is inserted.

Connection about SD card is shown below.

Signal Name	Terminal CPU name at connection destination	Function	Logic
CS	PDH5	Chip Select	Active-Low
Data In	SOB0 (P41)	Data Input	Active-High
CLK	SCKB0 (P42)	Clock	Active-High
Data Out	SIB0 (P40)	Data Output	Active-High
CD	INTP1 (P04)	Card Detection	Active-Low
WP	P77	Write-Protect Detection	Active-High
SDOE	PDH4	SD Card Signal Line Effective Output	Active-Low
SDPO	P78	Output SD Card Power ON	Active-Low

9 Temperature sensor

CPU board has a temperature sensor for measure ambient of PWB board, that is connecting to analog input pin （P70/ANI0） of CPU
The temperature sensor outputs a voltage depending on the temperature. The temperature can be retrieved by setting P70 port to A/D converter input.
When the temperature of device is 30℃, the sensor outputs the voltage of about 1.474V. The changes of voltage on temperature is -8.20mV/℃.

- Temperature sensor　S-8120C (Made by SII)
- Power Supply of sensor　:+3.3V

10　Operation by external power supply

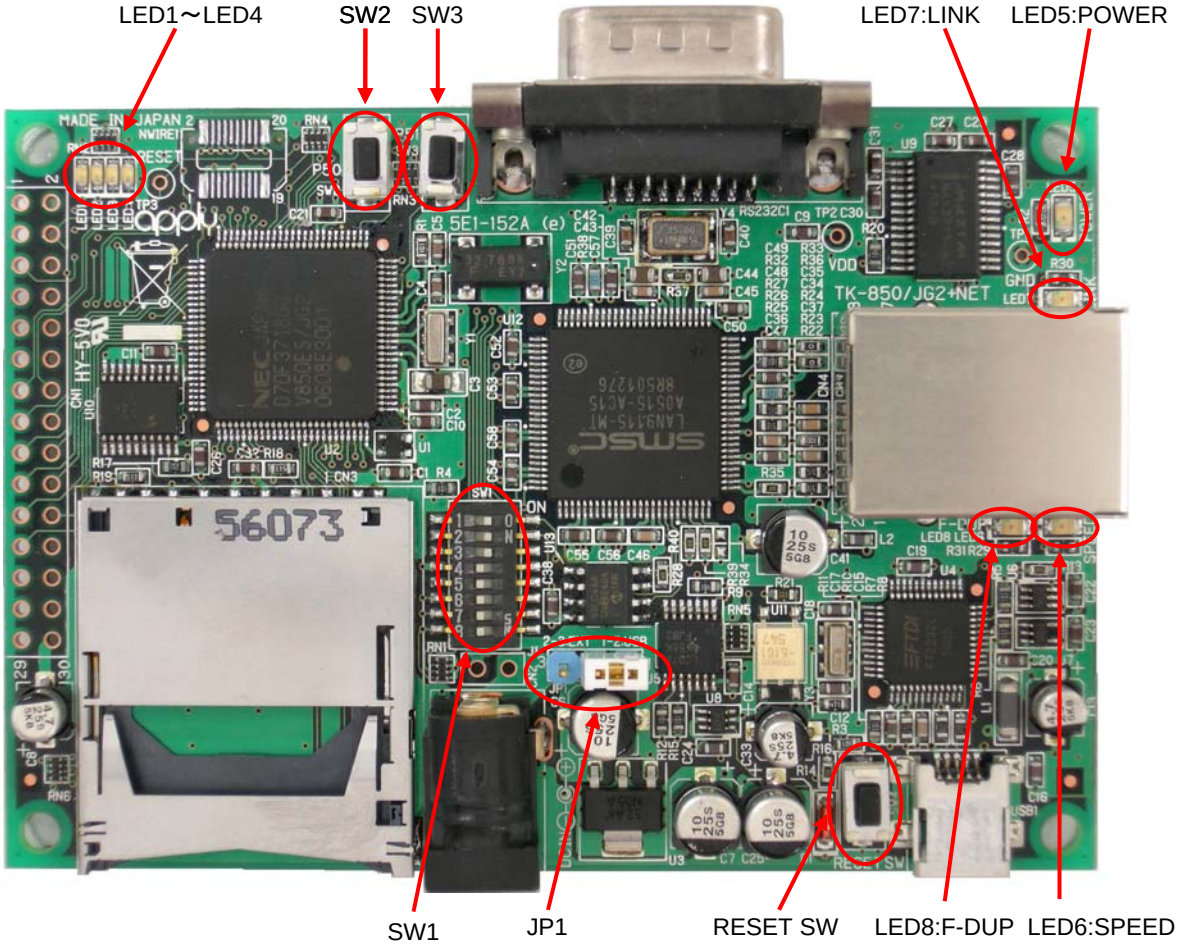
AC adapter can be connected to CN2. When you need to operate the board without connecting to USB, you can use the power supplied from AC adapter connected to CN2 by setting 2-3Pin short for the jumper pin (JP1).
Also, you can connect to regulated power supply with lead instead of AC adapter as CN2 is connected to J1 through-hole.

・Acceptable plug　　:2.1mm DC jack (center plus)
・Current capacity　　:500mA or more
・Supply voltage　　:5V

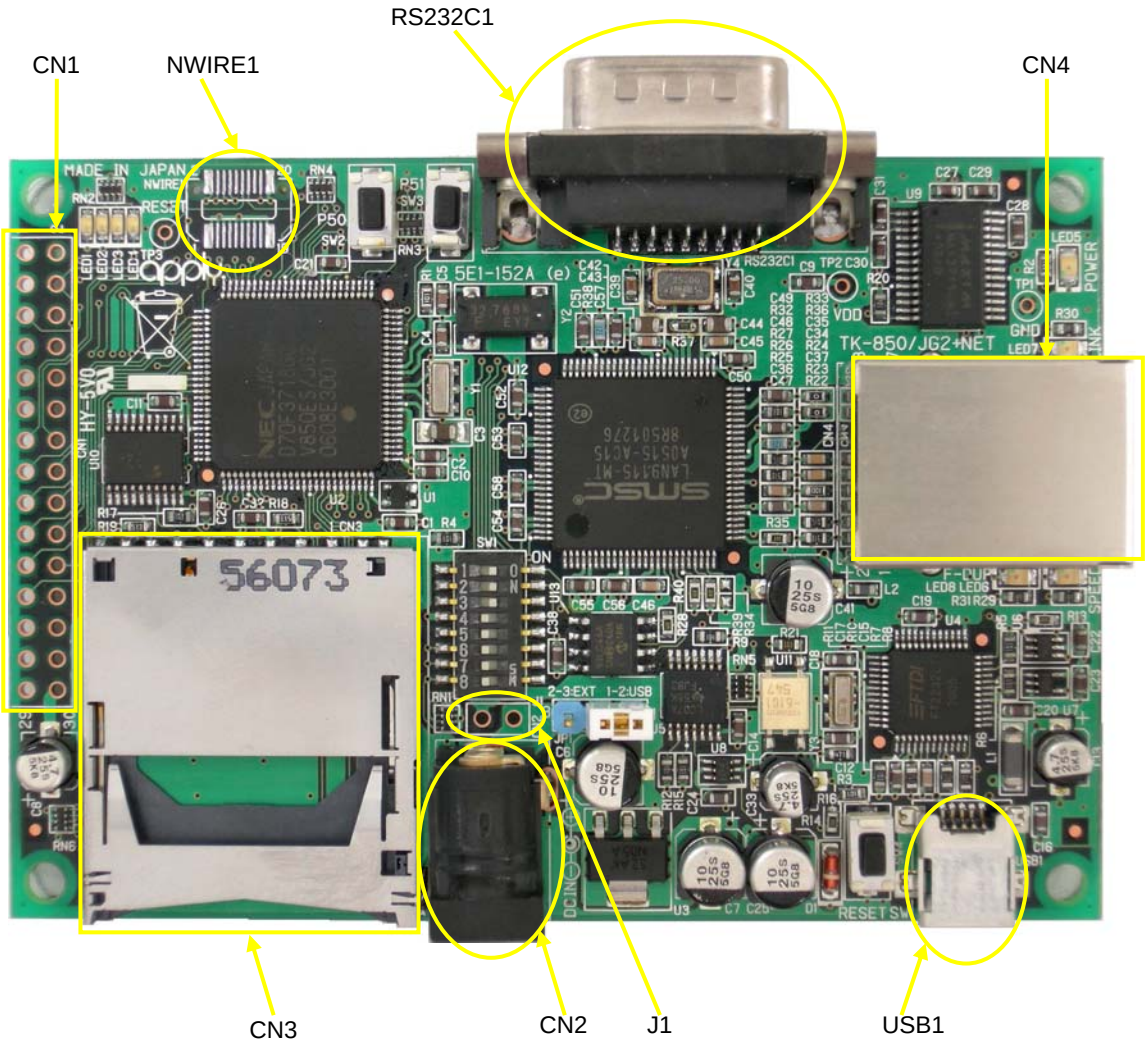
・J1-1pin:plus
・J1-2pin:minus

11　TK-850/JG2+NET Data

11.1　LED, Switch layout

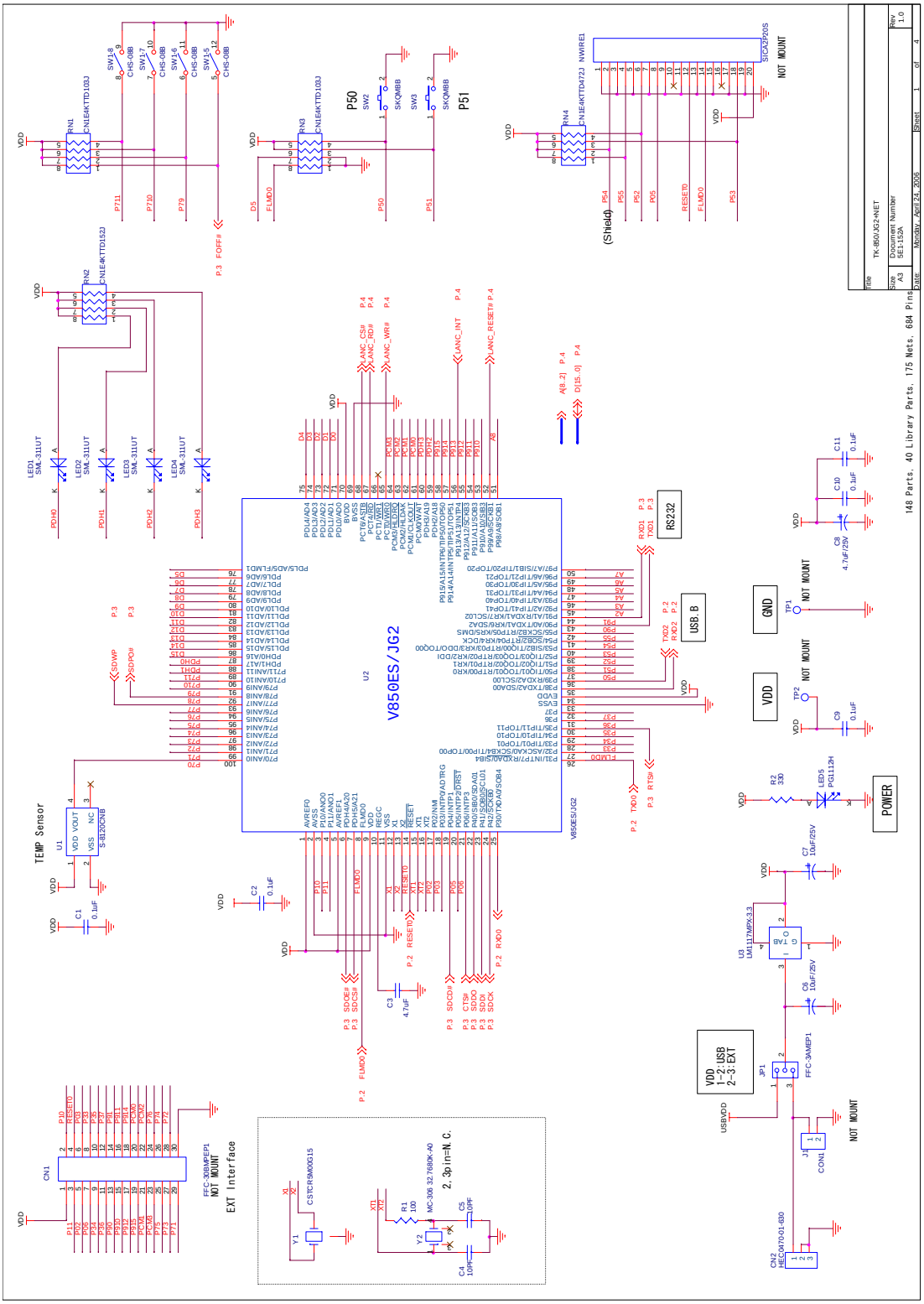


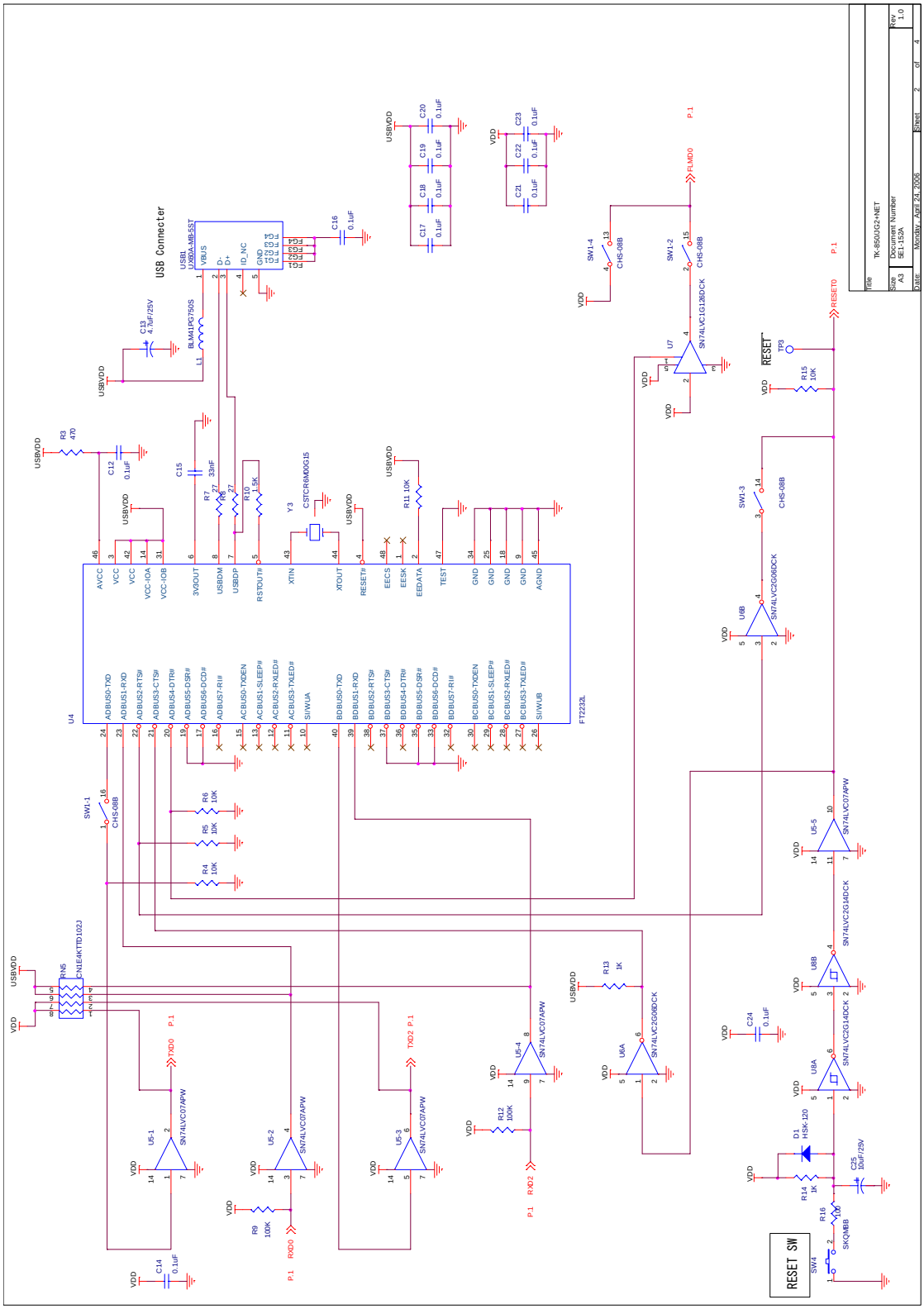
11.2 Connecter layout

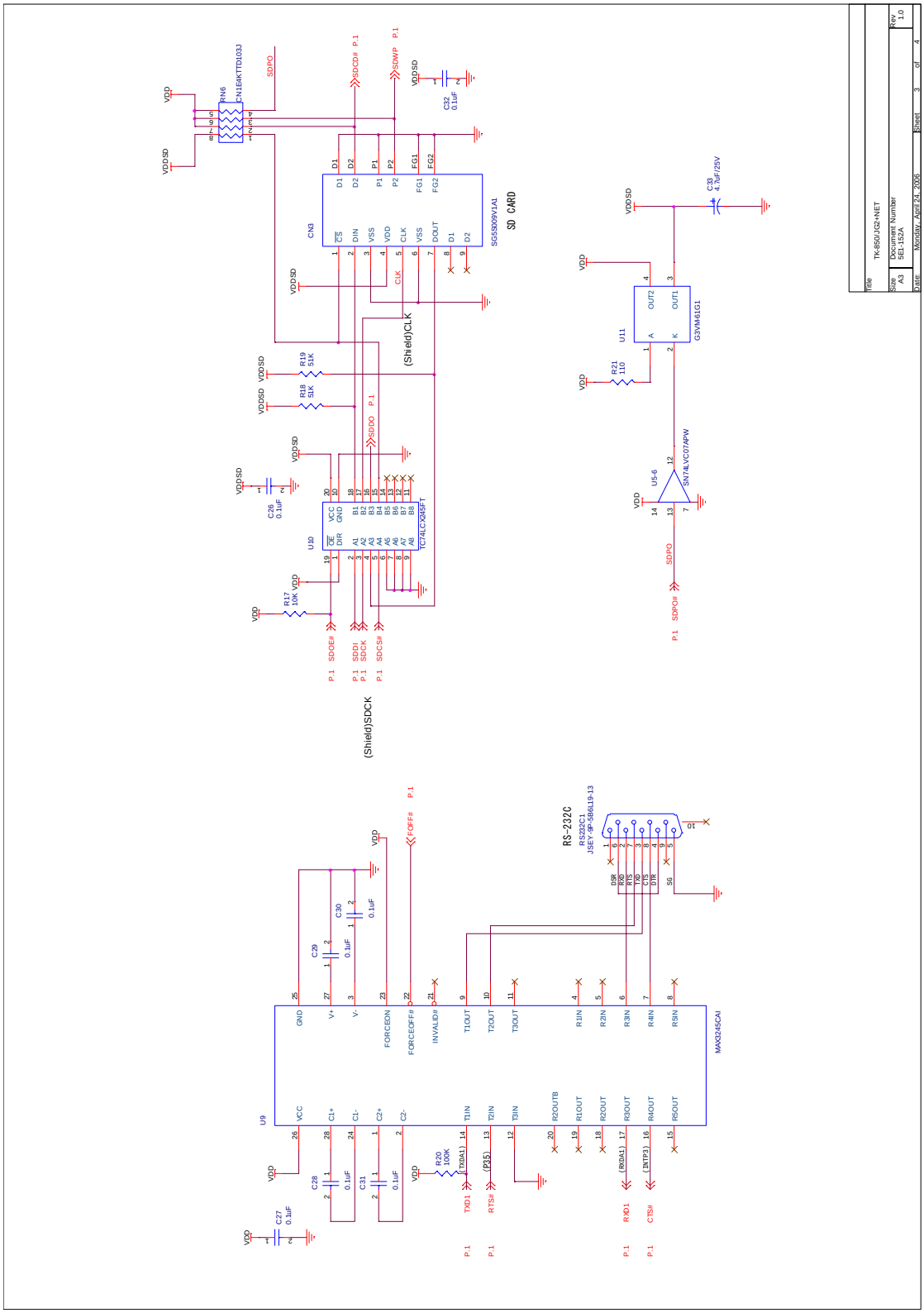


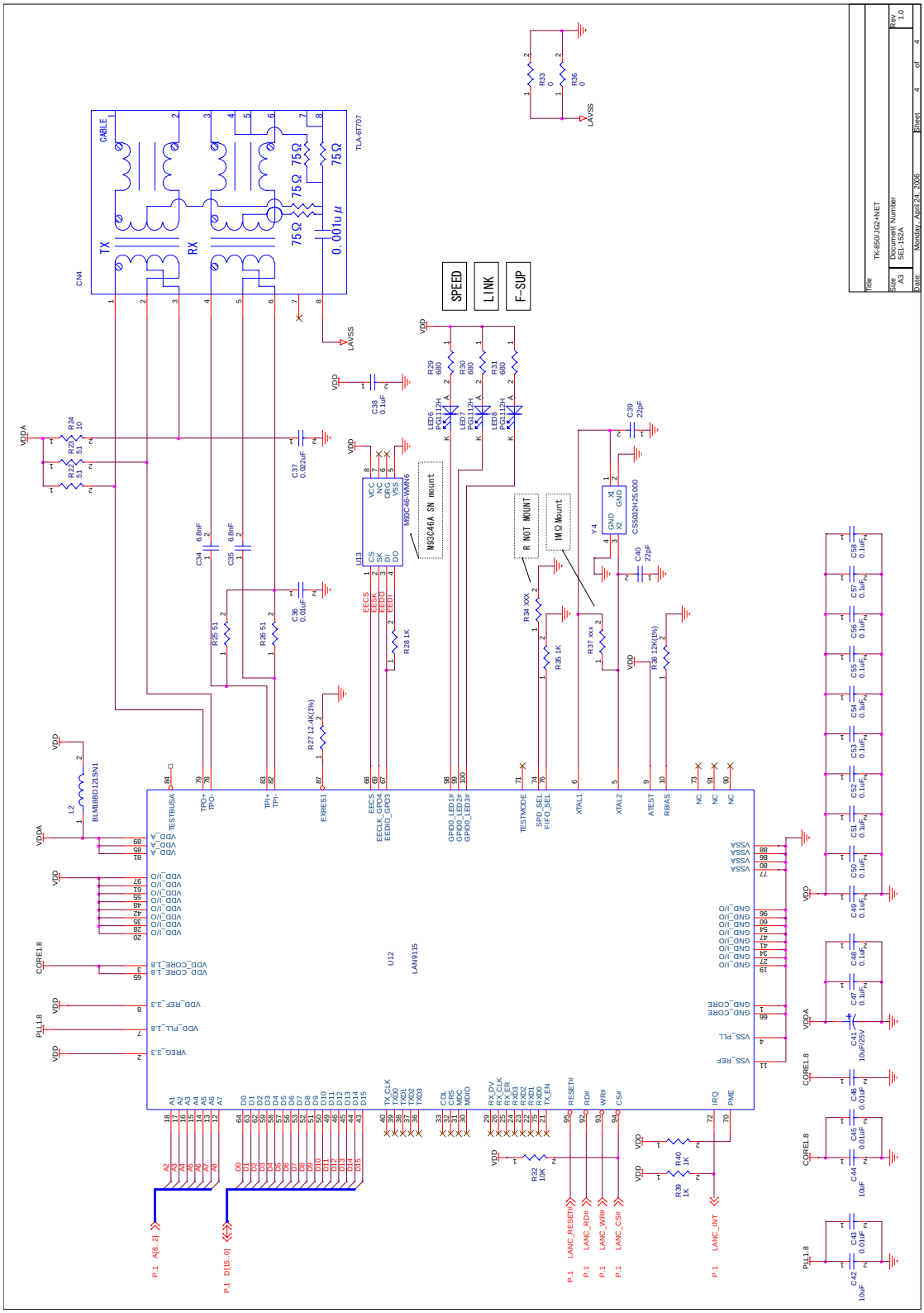
11.3 Dimension of the CPU Board

11.4 Circuit Diagram of the CPU Board




USB Connecter
FT232BL
SN74LVC07APW
SN74LVC2G07DCK
SN74LVC1G126DCK
SN74LVC2G14DCK
RESET SW
TK-850UG2+NET


SD CARD
(Shield)CLK
(Shield)SDCK
RS-232C
TK-850/JG2+NET
Monday, April 24, 2006
MAX3245CAI
TC74LCX245FT
SN74LVC07APW
G3VM-61G1


TK-850JG2+NET
SEL-152A
Monday, April 24, 2006
SPEED
LINK
F-SUP
CABLE
TLA-6f707
TX
RX
75Ω
0.001uμ
LAVSS
VDD
VDDA
CORE1.8
PLL1.8
U12
LAN9115
U13
M93C46-WMN6
M93C46A SN mount
R NOT MOUNT
1M Ω Mount
CS5032H25.000
TESTBUSA
TPO+
TPO-
TPI+
TPI-
EXRES1
EECS
EECLK_GPO4
EEDIO_GPO3
GPIO0_LED1#
GPIO1_LED2#
GPIO2_LED3#
TESTMODE
SPD_SEL
FIFO_SEL
XTAL1
XTAL2
ATEST
RBIAS
TX_CLK
TXD0
TXD1
TXD2
TXD3
COL
CRS
MDC
MDIO
RX_DV
RX_CLK
RX_ER
RXD0
RXD1
RXD2
RXD3
TX_EN
RESET#
RD#
WR#
CS#
IRQ
PME
LANC_RESET#
LANC_RD#
LANC_WR#
LANC_CS#
LANC_INT
P.1 A[8..2]
P.1 D[15..0]